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SYNGENTA ANNOUNCES NEW BUSINESS STRATEGY

Syngenta has announced a new strategy for its business that will set it apart from its competitors. Chief executive Mike Mack said at the recent 2010 Full Year Results Presentation on 9 February that the company intends to build on the combined strength of its Crop Protection and Seeds businesses to develop a fully integrated offer on a global crop basis. The global commercial operations for Crop Protection and Seeds will be fully combined by the end of 2012. "The plans have been underway for three years and the model has been tested intensively," added Mr Mack. "We have gained good experience in Italy, Bangladesh, the Andean countries and Brazil." It is estimated that integration will result in cost savings of around $150 million by 2015. Additional savings from procurement and supply chain efficiencies are expected to come to around $500 million, giving total annual cost savings of some $650 million in 2015.

Syngenta plans to create 19 territories with a strategic crop focus. The territories will be grouped into four geographic regions against which the company will continue to report. John Atkin, currently COO Crop Protection, will assume cross-business executive responsibility for the regions Europe, Africa and the Middle East, and Latin America. He will also have global strategic responsibility for cereals, soybean, sugar cane and speciality crops, and will continue to oversee Crop Protection performance. Davor Pisk, currently COO Seeds, will assume cross-business executive responsibility for the regions North America and Asia Pacific. He will also have global strategic responsibility for corn, diverse field crops, rice and vegetables, and will continue to oversee Seeds performance.

Mr Mack said: "We will be developing an expanded crop-based pipeline by bringing together R&D in Crop Protection and Seeds. This will generate combined genetic and chemical solutions which also address abiotic stress. The intention is to create new markets in the same way as we have done with *Plene* our integrated solution for sugar cane in Brazil and with the launch of our *Tegra* integrated rice programme in Asia. We also aim to develop novel go-to-market models, building on our success in reaching new customers in emerging markets. We will also seek value-added partnerships and collaborations which maximise our return on R&D and bring new offers to the growers more quickly."

Syngenta aims to gain an average 0.5% market share annually across the combined business over the next five years. It will also target a group EBITDA margin in the range of 22-24% by 2015. It says that it is pursuing this new approach to its business from a position of strength and reported that in 2010 it achieved an increase in sales of 4% at constant exchange rates (CER) taking its global sales revenue to $11.6 million. Crop Protection sales were up 3% (CER), with 9% volume growth more than offsetting lower prices. Seeds sales registered volume growth of 8% with prices unchanged. EBITDA increased by 3% (CER) to $2.5 billion; the margin was 21.5% compared to 22.1% in 2009.

Syngenta said that its sales had almost doubled since its creation ten years ago. Expansion had been particularly rapid in the emerging markets, which now account for almost 50% of its sales. The company's leading position in these markets, the key driver for the industry in terms of population growth and dietary change, will it said be pivotal to its future success. Global growth in both Crop Protection and Seeds has been accompanied by a significant improvement in profitability, with an EBITDA margin of 21.5% in 2010 compared to 17.8% in 2001.

Mr Mack added: "Our success over the last ten years reflects the breadth of our portfolio and our dedicated focus on agriculture. In Crop Protection, we have grown share to become the world leader, with unrivalled product and distribution strength. At the same time, as growers' seeds purchasing decisions have increased in importance, we have built a global Seeds platform incorporating leading technology, which is transforming the scale and scope of our business. As a result, we now have a unique capability to address the increasing complexity of the challenges facing farmers by developing a fully integrated offer on a global crop basis. This offer will expand our reach while enhancing efficiency, with game-changing technologies encompassing new products, solutions and local go-to-market strategies. These will be continuously adapted in order to anticipate and meet the needs of the farmer of the future. Our goal is to create value for our shareholders by first creating value for our customers, including both channel partners and growers. By so doing, we will continue our contribution towards improving global food security."

Crop protection sales

In reviewing crop protection sales for 2010 Syngenta said that volume growth accelerated from the second quarter, with a strong Latin American season and a good performance in Asia Pacific boosting sales in the second half of the year. Following two years of price increases, the company says the price environment was competitive, notably in North America where high channel inventories led to a high level of rebate activity, particularly in the second quarter. Although prices were also lower in the second half, the rate of decline decreased and prices remain higher compared with their level three years ago. The EBITDA margin was below the record level reached in 2009 as a result of lower prices and investments in emerging markets, R&D and systems.

In Europe, Africa & the Middle East the business recovered well after a late start in the first half caused by weather and high channel inventories, notably in France. Eastern Europe continued to expand despite drought in Russia over the summer. In North America, the impact of the competitive price environment was partly offset by substantial volume growth starting in the second quarter. Latin America saw improved weather and economic conditions as well as higher commodity prices, and Syngenta was able to further reinforce its leading market position there. In Asia-Pacific, demand was sustained throughout the year particularly in the emerging markets, where growers continued to invest in order to improve yield.

Sales of new products, those launched since 2006, increased by 25% to $402 million. The herbicide *Axial* was launched on cereals in France and Russia. The fungicide *Revus* showed strong growth in the US and in a number of emerging markets. Sales of the insecticide *Durivo/Ampligo* more than doubled with a highly successful launch in Brazil on corn and soybean and strong growth in emerging Asia. Sales of the seed treatment *Avicta* also doubled with a launch on corn in the US and growth on cotton in Brazil, where a registration on soybean has also been received. Isopyrazam, the first in a new class of next generation fungicides, had a successful initial launch on barley in the UK. The Crop Protection pipeline has peak sales potential in excess of $2.0 billion and includes a number of large products with multi-crop applications. In 2011 the company will launch *Plene*, its new integrated solution for sugar cane in Brazil; estimated peak sales should be greater than $500 million. In 2012, Syngenta plans to launch *Sedaxane*, a broad spectrum seed care fungicide.

EUROPEAN NEWS AND MARKETS

ARYSTA CREATES NEW SUBSIDIARY IN UKRAINE

Arysta LifeScience has created a new subsidiary in Kiev, Ukraine. Arysta LifeScience Ukraine LLC will aim to strengthen the company's business development position in Eastern Europe. "With an emerging and dynamic crop protection market, Ukraine offers substantial growth opportunities for the company. The creation of this subsidiary is a key milestone to ensure that we dedicate sufficient management focus, human resources and capital to the growing CIS market," said Dmitry Tsivilev, manager of the region. "While we have been working in Ukraine for a long time now, creating a full-service subsidiary ensures Arysta LifeScience's ability to provide even more support to our customers and partners locally."

BASF LAUNCHES NEW POTATO FUNGICIDES

BASF has launched two new potato blight fungicides in the UK based on *Initium* which is from a totally new class of chemistry, the pyrimidylamines, and has no cross-resistance to any existing fungicides. Rob Storer, potato product manager for BASF, explained that *Initium* is the trade-mark of the new active ingredient ametoctradin. *Decabane* contains 80 g/kg ametoctradin and 480 g/kg mancozeb and is formulated as a water dispersible granule; *Resplend* contains 300 g/litre ametoctradin and 225 g/litre dimethomorph and is formulated as a suspension concentrate.

BASF says that *Initium* cuts the energy flow of the fungus by inhibiting mitochondrial respiration at an unknown binding site within the cell. It shows no cross resistance to QoI chemistry as it works at a different site. The company has also investigated its activity on zoospores, the causal agents of tuber blight in potatoes, and laboratory work clearly shows that it causes zoospores to burst within seconds of application and at very low concentrations. It also controls the infectious stages of the blight fungus and other oomycete pathogens.

Phil Brown, agronomy manager for BASF, explained: "We know that *Initium* controls disease by inhibiting the infectious stages of the pathogen, by preventing zoospore formation and release and through direct effects on the germination and mobility of sporangia. When combined with dimethomorph we have a product that offers protectant, locally systemic and translaminar activity with options for use at rapid canopy, stable canopy and senescence. *Resplend* is a mancozeb-free option which may appeal to some sectors of the industry. In trials it compares well against any of the key blight fungicides in terms of both foliar and importantly tuber blight. It also has fantastic rainfastness and looks to be one of, if not, the best in trials work. *Decabane* has also performed well as a protectant fungicide, as it contains two protectant actives. It has an important place in the blight programme during stable canopy." Both products can be applied at seven to 10 day intervals and ametoctradin can be applied up to four times in any one crop.

MAKHTESHIM LAUNCHES GROWTH REGULATOR

Makhteshim Agan UK (MAUK) has launched its first cereal growth regulator. *Optimus* is an optimised formulation of trinexapac-ethyl that allows more efficient uptake of active ingredient into the plant which maximises its lodging prevention properties. The company says that the adjuvant system developed within the formulation reduces the surface tension of the spray droplet on the leaf. This increases the contact surface area of the droplet allowing more active ingredient to move into the leaf over a given time. Tests using radiolabelled carbon show that 85% of the trinexapac-ethyl contained in *Optimus* moves into the wheat leaf within five hours, compared with just 35% of that in the current industry standard. After 24 hours, the industry standard had still only delivered 50% into the leaf.

Stuart Hill, technical and development manager of MAUK, said: "All other brands of trinexapac-ethyl are identical copies of the original, so offer nothing more. *Optimus* gives a consistent dose response without compromising crop safety, so growers can be sure they will get a reliable result when they need it most." The improved EC formulation means *Optimus* contains less active ingredient than the standard – 175g/litre of trinexapac-ethyl compared with 250g. "MAUK is the first company to offer a real and formulation-enhanced alternative to the current standard. *Optimus* is further evidence of its transition from generic producer to agrochemical development company," added Mr Hill.

SYNGENTA RECOMMENDS PLENUM ON OILSEED RAPE

Syngenta says that its new recommendation for *Plenum* (pymetrozine) to be used on oilseed rape in the UK for the control pollen beetle could be very important in 2011. Evidence from continental Europe indicates that, after cold winters and delayed crop growth, higher populations of the pest can occur at the green bud stage. Recent climatic conditions suggest that heavy infestations of the pest can therefore be expected. *Plenum*, already used extensively for aphid control in potatoes and vegetable crops, and registered for use on oilseed rape in November 2010, has effectively controlled pollen beetle in 52 trials carried out since 2007 in 13 northern European countries.

The *Plenum* approval is for one application per crop, at the green to yellow bud stage. The insecticide will be targeted at situations where pollen beetle resistance to the pyrethroids has been identified. In the UK resistant pollen beetles were reported in about 15% of the population in 2010, with 65% showing some level of resistance. In Germany 80% of beetles are resistant.

SYNGENTA LAUNCHES SEGURIS

Syngenta's new wheat fungicide (*January CPM*) has now been officially approved in the UK by the Chemicals Regulation Directorate **(**CRD). The product called *Seguris* contains the company's new active ingredient isopyrazam and BASF's epoxiconazole. Syngenta says that the fungicide is arriving at an ideal time to help wheat growers to respond to the current high grain prices. Mark Hall, Syngenta's business analyst, said that factors such as last year's Russian ban on grain exports, lower than expected harvests in the US and Australia and high commodity demand from China were just some of the reasons which had led to a doubling of the UK wheat price over the past 12 months. Additionally the steep increase in world grain consumption means that it outstripped production in 2010/11. The higher wheat prices should therefore remain buoyant and the case for using new technology has become stronger. In trials *Seguris* has given up to two tonnes/ha yield benefit over a straight triazole. Syngenta says that even at lower grain prices these increases would be worthwhile.

AMERICAN NEWS AND MARKETS

MONSANTO ACQUIRES DIVERGENCE

Monsanto has acquired Divergence Inc. (**www.divergence.com**), a St Louis-based biotechnology research and development company. The current focus of the company's work is with parasitic nematodes, including developing biotechnology traits for nematode control and nematicides with novel modes of action and superior safety profiles. "Nematodes are one of the most challenging agricultural pests farmers face each year, and we have seen them become more pervasive," said Dr Robb Fraley, Monsanto's chief technology officer. "They cost farmers millions in damage to crops like corn, soy, cotton and vegetables. Divergence has promising tools in its pipeline, including a nematicide which we believe could be used as a valuable seed treatment formulation to maximise the performance potential of the seeds and traits that farmers plant."

Divergence and Monsanto established a collaborative relationship in August 2004 under which the two companies worked to develop nematode-resistant soybeans. In 2008, they made public their sequence of the soybean cyst nematode genome, and further extended their relationship. "Over the years, we have had a productive and successful partnership with Divergence," Dr Fraley said. "We look forward to continuing this tradition and welcome Divergence's highly experienced and talented employees to the Monsanto team."

BAYER RECEIVES APPROVAL FOR COTTON TECHNOLOGY IN BRAZIL

The National Biosafety Technical Commission (CTNBio) in Brazil has granted approval for *TwinLink* technology for cotton developed by Bayer CropScience. The *TwinLink* technology contains two insect resistance genes which confer important characteristics to cotton seed for effective management of a number of lepidopteran pests. *TwinLink* cotton is fully tolerant to glufosinate-ammonium herbicides (*Ignite* and *Basta*). According to Joachim Schneider, head of the BioScience business unit of Bayer CropScience, the new technology will allow the Brazilian farmers to manage both pests and weeds and the quality of the cotton lint that is produced. *TwinLink* is one product in a series of new weed and insect management solutions being developed for the cotton farmer by Bayer CropScience. In Brazil, the company is already marketing *LibertyLink* cotton and, in December 2010, CTNBio approved the commercial use of *GlyTol* technology, which enables the selective use of a glyphosate-based herbicide to control weeds.

SYNGENTA RECEIVES US APPROVAL FOR QUADRIS TOP

Syngenta Crop Protection has received Federal EPA registration and California Department of Pesticide Regulation approval for the fungicide *Quadris Top* (azoxystrobin + difenoconazole) for use on tomatoes and potatoes in California. "Containing both a triazole and a strobilurin, *Quadris Top* offers growers a high level of activity and reliability for complete control of many important plant diseases on a wide range of crops," said David Laird, Syngenta fungicide brand manager. "Its low-use rates and application flexibility make it an effective addition to many integrated pest management (IPM) programmes." The fungicide provides high intrinsic activity, rainfastness and rapid uptake with translaminar movement of difenoconazole and the xylem-mobile movement of azoxystrobin.

SUMITOMO RESTRUCTURES ITS BUSINESS IN LATIN AMERICA

Sumitomo Chemical Co. Ltd (SCC) is to restructure its crop protection business in Latin America and has announced the formation of a newly named business unit, Sumitomo Chemical Latin America (SCLA). The company says that its products and active ingredients have had a growing presence in Latin America since 2004 while it has operated as the Latin American Division of Valent USA. However, because of the future growth potential of the crop protection market in Latin America, SCC now recognises the need to establish a new business unit. Headquartered at the Sumitomo Chemical do Brazil (SCB) office located in Sao Paulo, Brazil, SCLA will have employees located in all of the key Latin America markets. Mike Donaldson, president and chief executive officer for Valent USA, Valent BioSciences Corporation and Region Americas, will oversee the new organisation which will work more closely with regional customers. He said: "By increasing our presence and resources in Latin America, we will have even closer access to customers in order to improve our service and better understand and anticipate their unique crop needs." As part of the restructuring, the SCLA business unit will soon name a vice president of crop protection to lead the new operation. Jose P Fabretti will oversee the regional sales, marketing and business development efforts; Fabre Luis Paulo Antonialli

will manage the region's product development and regulatory affairs group. The Sumitomo Chemical Environmental Health and the Animal Nutrition business units will continue to operate separately from the SCB Sao Paulo office.

FMC RECEIVES FULL REGISTRATION FOR ITS INSECTICIDE BELEAF

FMC Corporation has received full registration for the insecticide *Beleaf 50SG* (flonicamid) for both the US and Canada. The company says that with full registrations now in place, Canadian MRLs have been established, allowing the free movement of commodities treated with the insecticide. "*Beleaf* is an effective treatment for control of aphids in fruit and vegetable crops, and with the full registrations is a convenient choice for growers," said Bob Leifker, product manager for FMC Agricultural Products. "*Beleaf* controls insects before they damage the plant, making it an effective choice as part of an overall pest management programme." Easy on beneficials, the insecticide is effective on the A-Type Potassium channel of an insect's nervous system. It controls pests through contact and ingestion, providing an anti-feeding mode of action that stops feeding in as little as 30 minutes thus protecting plants from severe insect damage and disease. *Beleaf* controls key pests including aphids in a number of crops including apples, leafy vegetables, tomatoes, potatoes and cucurbits, and it has a zero day pre-harvest interval on most crops.

BAYER TO CONSTRUCT NEW GREENHOUSE FACILITY IN US

Bayer CropScience plans to construct a new greenhouse facility at its North American headquarters located in Research Triangle Park, North Carolina, for about $20 million. The new state-of-the-art greenhouse will be a key facility in support of the expansion of BioScience research and development activities within the US. The greenhouse will be designed to conduct GM and non-GM trait research, and also will support discovery research for molecular breeding and the development of data packages for trait deregulation. The total area of the building will be about 5,600 square metres, with about 2,800 square metres of greenhouse space, and will accommodate 25 members of staff. "We are continuing to expand our activities in seed traits. With the BioScience Innovation Centre in Morrisville and the construction of the new greenhouse, Research Triangle Park is rapidly becoming a major research hub for our company," said Sandra E Peterson, chairman of the board of management of Bayer CropScience.

GOWAN ACQUIRES BUSINESS IN CHILE

Gowan Comércio Internacional e Serviços, Limitada (GCIS), an affiliate of Gowan Company based in Yuma, Arizona, has acquired a majority share in Agro Technology, S.A. (AGT) located in Santiago, Chile. The company expects the investment to help expand its presence in the South American crop protection markets. "Chile is a sophisticated market with high agricultural standards, recognised worldwide as a leading country in fresh fruit production," said Sergio Comparini, business development manager for Gowan Company. "AGT's support of IPM programmes aligns perfectly with our goal of bringing a bio-pesticide and chemical approach to Chile and other South American countries for fruit and vegetable crops." The existing management team at AGT will continue serve customers in Chile.

NUFARM AND SUMITOMO TO FORM ALLIANCE IN MEXICO

Nufarm Americas and Sumitomo Chemical Company's affiliate Valent de Mexico intend to form a strategic alliance in Mexico to distribute crop protection products. Nufarm will provide selected products which Valent will market through its well-established existing distribution channel. "Nufarm and SCC are now working together in many regions of the world to explore alliances that can capitalise on each of our strengths," says Robert Renes, Nufarm vice president for Latin America North. "The combination of our broad product line and Valent's distribution channel relationships will benefit both companies and our customers in Mexico." Valent has focused on speciality crops and branded products, while Nufarm is one of the world's largest suppliers of herbicides for broad-acre crops as well as a wide array of fungicides and insecticides. Valent will have exclusive rights to sell certain Nufarm products to its distributors under private branded labels. Nufarm will continue to sell products to industrial customers.

DUPONT TO INVEST IN SOYBEAN RESEARCH

DuPont plans to invest more than $50 million over five years to expand its biotech soybean research and development programme in Delaware, US. The company says that the proposed investment supports its strategy to increase food productivity for a growing global population. John Bedbrook, vice

president of DuPont Agricultural Biotechnology, said: “It will increase the speed at which we can bring new products to the market and help farmers around the world increase yields through tolerance to environmental stresses, insects and disease.” The proposed investment will be made at the company’s experimental station in Wilmington and at its Stine Haskell Research Centre in Newark, Delaware. The expansion is expected to create 75 new, full-time positions in Delaware by the end of 2015.

The plans includes new soybean research laboratories, tissue culture facilities, environmentally controlled growth rooms and greenhouses, which will not only benefit soybean R&D efforts but also extend research resources for other core crops. The Delaware Economic Development Office (DEDO) has offered a $1.5 million grant from the Delaware Strategic Fund to create jobs and to assist with the development of the new centre. An additional $125,000 grant will be come from the Delaware Department of Agriculture (DDA).

SYNGENTA TO INTRODUCE ITS CORN AMYLASE TRAIT

Syngenta has received full deregulation for its corn amylase trait from the US Department of Agriculture (USDA). This is the first genetically modified output trait in corn for the ethanol industry. By enabling expression of an optimised alpha-amylase enzyme directly in corn, dry grind ethanol production can be improved in a way that can be easily integrated into existing infrastructure. Syngenta will sell corn seed with the amylase trait as *Enogen* corn seed. “*Enogen* offers growers an opportunity to cultivate a premium speciality crop. It is a breakthrough product that provides US ethanol producers with a proven means to generate more ethanol from their existing facilities,” said Davor Pisk, Syngenta’s chief operating officer. “It also reduces the energy and water consumed in the production process while substantially reducing carbon emissions.” The corn amylase trait in *Enogen* has already been approved for import into Australia, Canada, Japan, Mexico, New Zealand, Philippines, Russia and Taiwan, and for cultivation in Canada. Seed will be available for the coming growing season. This year, Syngenta plans to work closely with a small number of ethanol plants and corn growers and will prepare for larger scale commercial introduction in 2012.

OTHER NEWS AND MARKETS

DOW FILES PATENT APPLICATION FOR HERBICIDE EVENT IN CORN

Dow AgroSciences has published an international patent application for its lead commercial herbicide tolerance event in corn. The corn event is part of Dow AgroSciences' innovative new class of herbicide tolerant traits which convey tolerance to the broadleaf weed herbicide 2,4-D. Dow's patent filing is expected to provide proprietary protection for corn plants containing the event, methods for controlling glyphosate-resistant weeds, and uses of Dow AgroSciences' herbicide tolerance trait in combination with novel 2,4-D herbicides, the FOP family of herbicides, and other broad spectrum and selective herbicides. The patent application also covers stacking the event with other traits, including traits for tolerance to other herbicides and/or traits conferring insect-resistance in corn.

Dow has also announced that it is calling the new herbicide tolerant trait system *Enlist Weed Control System*. Regulatory approvals for the components are pending. Commercial launch in the US of the *Enlist Weed Control System* is anticipated in corn for the 2013 crop year with other crops to follow.

BAYER AND REITZEL COLLABORATE ON GHERKINS IN INDIA

Bayer CropScience and Reitzel Groupe, an international food company located in Aigle, Switzerland, plan to expand their collaboration on the sustainable production of high-quality gherkins in India. Both partners have been working together in this food chain partnership project since 2009. The aim of the project is to improve the yield and the quality of gherkins by developing and implementing good agricultural practices (GAP). Bayer CropScience offers Reitzel and Indian farmers innovative crop protection solutions and technical expertise. In order to preserve natural resources, farmers have been advised and trained on GAP including modern cultivation methods, the safe use of crop protection products and improved water management. In addition Bayer CropScience's vegetable seed business, Nunhems, provides *Ajax*, a high-yielding hybrid gherkin variety with good processing qualities.

Reitzel's technicians support farmers with expertise on gherkin cultivation, trade requirements and customer specifications. The overall objective is to ensure a continuous supply of fresh and high-quality gherkins to the Reitzel factories in India and France as well as for export to various countries. "This collaboration with a global company like Bayer CropScience demonstrates our commitment to the Indian gherkin industry", commented Bernard Poupon, CEO of Reitzel Groupe. "Contract farming with Reitzel advice and Bayer agronomical support is considered to be the most appropriate method of growing gherkins. This supports growers in their efforts to market their goods locally and internationally." Reitzel India was created in 2005 and produces 13,000 tons of gherkins a year. The company employs 400 people and works directly with 5,000 farmers.

CONFERENCES AND FEATURES

GM CROPS UP 10% IN 2010

The area of GM crops grown globally increased by 10% in 2010 to 148 million hectares. “That is the second highest annual growth ever,” said Clive James author of the annual report released by ISAAA (International Service for the Acquisition of Agri-biotech Applications). “In just 15 years the accumulated area exceeded one billion hectares in 2010, a significant milestone that indicates that GM crops are here to stay. With an unprecedented 87-fold increase between 1996 and 2010, it has become the fastest-adopted crop technology in the history of modern agriculture.”

In 2010 the ten largest GM crop growing countries each had more than one million hectares in production. In order, they rank US (66.8 million), Brazil (25.4 million), Argentina (22.9 million), India (9.4 million), Canada (8.8 million), China (3.5 million), Paraguay (2.6 million), Pakistan (2.4 million), South Africa (2.2 million) and Uruguay (1.1 million). Brazil has been leading the way and had the largest year on year increase. After expediting 27 approvals, eight in 2010, and securing export trade agreements Brazil now plants 17% of the world’s GM crops. Resulting productivity increases have helped fuel the country’s ability to double its annual grain production since 1990 while increasing the area of land cropped by only 27%. Only the US leads Brazil in the area of land devoted to GM crops.

“Developing countries grew 48% of global GM crops in 2010 and will exceed industrialised nations by 2015,” said Mr James. “Clearly, Latin America and Asia will drive the biggest increases during the remainder of the technology’s second decade of commercialisation.” The five principal developing countries growing GM crops – China, India, Brazil, Argentina and South Africa – planted 63 million hectares in 2010, equivalent to 43% of the global total.

Of the 15.4 million farmers using the technology in 2010, 14.4 million were small-scale, resource-poor farmers in developing countries. China and India now have the most small-scale farmers using GM, with 6.5 million Chinese farmers and 6.3 million Indian farmers planting GM seed. More than one billion people throughout Asia, who are members of the 250 million small-scale rice-producing households cultivating around half a hectare, are potential beneficiaries from the expected commercialisation of insect-resistant *Bt* rice expected to be introduced before 2015 “This is important progress,” said Mr James. “Up to 6,000 deaths a day can be prevented with Golden Rice for vitamin A deficient populations, which is expected to be available for planting in the Philippines by 2013 followed by Bangladesh, Indonesia and Vietnam.”

In 2010, three countries grew GM crops commercially for the first time, and one started again. Approximately 600,000 farmers in Pakistan and 375,000 farmers in Myanmar planted insect-resistant *Bt* cotton, and Sweden, the first Scandinavian country to commercialise GM crops, planted a new high-quality starch potato approved for industrial and feed use. Germany also planted the same potato in 2010, resuming its place among the eight EU member states now growing either GM maize or potatoes.

Mr James said he expects another 12 countries to adopt GM crops by 2015, the number of farmers to double to 20 million, and the area grown to double to 200 million hectares. He said there is still considerable potential for increasing GM adoption in the four largest crops maize, soybean, cotton and canola. Currently at almost 150 million hectares in 2010 they could double. Drought tolerant maize is expected in the US as early as 2012, and importantly, in Africa by 2017. The decision, four years ago, to delay GM herbicide tolerant wheat is also being revisited and many countries are fast-tracking the development of wheat with a range of traits including drought tolerance, disease resistance and grain quality. The first of these is expected to be ready for commercialisation as early as 2017.

Mr James expects several other GM crops to be approved by 2015, including GM potatoes resistant to late blight, sugarcane with improved agronomic and quality traits, disease-resistant bananas, *Bt* eggplant, tomato, broccoli, and cabbage, as well as some pro-poor crops, such as GM cassava, sweet potato, pulses and groundnut. The 29 countries which planted GM crops in 2010 already represent 59% of the world population, and Mr James is cautiously optimistic about the contribution that the technology can make to the 2015 Millennium Development Goals of food security and poverty alleviation.

NEW PARADIGMS IN CROP AND SOIL MANAGEMENT

A one day conference to discuss New paradigms in crop and soil management *was held in London on 9 February. The event was organised by the Biosciences Knowledge Transfer Network which has a remit to facilitate innovation in agriculture, food and industrial biotechnology by bridging between the UK research-base and industry (**www.ktn.innovateuk.org**). Dr Alan Baylis reports for* Crop Protection Monthly.

Crop protection

Dr Ray Elliott, senior scientific advisor at Syngenta, presented an overview of seed treatment technology and products. The sector was valued at $2.5 billion in 2009. North America accounts for more than half the market with corn being the leading crop, by far. Growth is particularly fast in South America where seed treatments for soybeans in Brazil are growing at 7.5% per annum compared to the overall figure of 3.5%. Asian markets such as rice are also growing fast, although from a much lower base. Seed treatments were originally a means of applying fungicides and insecticides but crop protection seed treatments now include nematicides and are being seen by the industry as much more 'functional.' Insecticides and fungicides such as thiomethoxam and azoxystrobin have been proven to give yield benefits by relieving abiotic stresses such as heat and drought, and 'biologicals' are now appearing as crop enhancement agents. In the US, Plant Health Care has licensed its harpin seed treatment technology to Monsanto for use on a wide range of crops under the *Acceleron* brand. Seed treatments with 'six or seven components' are now in development and may include micronutrients, phytohormones and N-fixing Rhizobia bacteria all encapsulated around seeds in a polymer matrix for controlled release. Improved triggered release in response to stimuli such as pH or temperature is also an R&D target.

Anne Osbourn, John Innes Centre, Norwich focused on take-all (*Gaeumannomyces graminis*) as an example of a serious yield-limiting soil pathogen, which could well become more of a problem with intensified production and climate change. Take-all results in annual losses estimated to be worth £75- 300 million ($120-480 million) in the UK alone. Pressure to grow more second and subsequent wheat crops in milder, wetter winters and drier summers will only exacerbate the problem. As soil-borne pathogens are difficult to control chemically, breeding resistant varieties seems a preferred approach. However, wheat and barley have no resistance, although oats and rye are resistant to take-all. The oat gene has been characterised and could be a source of resistance for GM wheat. There is also a gene for resistance present in the diploid wheat *Triticum monococcum*. It is well known that take-all becomes less severe in continuous wheat, but the phenomenon of 'take-all decline' is not well understood. Studies on the pathogen and interactions with the crop and other microorganisms have indicated that there are two groups of G. graminis, populations which develop in different ways in successive wheat crops. Another area which may ultimately result in better control strategies include researching the response of host plant defence systems to specific pathogen molecules known as PAMPs (pathogen-associated molecular patterns).

Soil microbiology

Several speakers including Sylvain Pellerin from INRA, the French National Institute for Agricultural Research, discussed the importance of gaining a better understanding of soil microbiology. Reducing the contribution of agriculture to greenhouse gas emissions is a key target. Soil microorganisms have been found to have nitrous oxide reductase genes (nosZ) which are of particular interest as they can reduce soil emissions. Fluxes of nitrous oxide from soils are highly variable and the French soil monitoring network has found six-fold variations in microbial DNA density in agricultural soils. So far, the presence of nosZ genes in soil seems to be associated with intensive cattle grazing in the rotation.

Ian Dodd, University of Lancaster, described how rhizosphere microorganisms may play a role in crop root-shoot signalling. His research into water-use efficiency has demonstrated that partial irrigation of only one side of a crop row can result in significant yield increases compared to uniform irrigation. Besides affecting root growth, this practice can stimulate microorganisms. Their activities can ultimately affect crop yield via plant hormone mediated effects. For example, the ethylene precursor 1-aminocyclopropane-1-carboxylic acid (ACC) may be used as a substrate, resulting in reduced concentrations of ethylene in roots. This, in turn, limits the usual plant response to abiotic stress. Further research could result in the potential for soil inoculation with yield enhancing microorganisms to be better understood.

Fertilisers

Over recent years, prices of NPK fertilisers have tracked oil prices, reflecting the high energy input into their manufacture. Although N fertiliser is made from atmospheric nitrogen, phosphate and potash are mined and ultimately limited. David Manning, Newcastle University, acknowledged concerns over future phosphate supplies, but considered that presently unexploited reserves would be utilised and more remained undiscovered. Also, there are options to recover phosphate from waste. He believes that potash supplies are a more pressing issue, as indicated by prices staying high while those of nitrogen and phosphate have fallen since oil prices peaked in 2008. Research into potassium-rich rock as an alternative source to water-soluble potash has failed to give promising results due to poor solubility. It was suggested that breeding crop varieties which produce root exudates rendering potassium more available would be a potential solution.

Andy Whitmore from Rothamsted Research noted the potential of chemical inhibitors of nitrification and denitrification, and precision application technology, to improve the efficiency of nitrogen use by crops. He also pointed to results from the classic long-term field experiments at Rothamsted in which yield benefits from the application of farmyard manure can be seen before there has been any major impact on soil organic matter levels, and above and beyond effects on N amendment per se. GM approaches to nitrogen-use efficiency are also being developed.

Soil management

Brian Chambers, ADAS, noted that all too few farmers take the time to regularly check on the condition of their soil. Surface cultivations and sub-soiling need to be conducted as appropriate to needs, not simply on a routine basis which can waste time and money. The Soil Protection Review 2010 now needs to be completed by farmers in England and is aimed at reducing erosion, increasing organic matter and avoiding compaction.

David Tinker of Controlled Traffic Europe reported on the advances being made in developing controlled traffic systems and the benefits to soil structure. Running all machinery along the same permanent wheelings avoids compaction over 80% of the field. Precision agriculture technologies now make this a viable option, although all equipment has to have compatible working widths, of course.

Finally Dick Godwin, formerly of Silsoe and Cranfield University, noted that in the UK soil-based crop management systems have made little progress for a quarter of a century as agricultural research has declined. He said there is now a skills crisis as the need for food security moves up the global agenda. Soil is key to sustainable farming systems and its successful management leads not only to better crops but also to less erosion and water run-off and reduced emissions of greenhouse gases.

SENTRY CONFERENCE

*The annual conference organised by Sentry Farming, UK (**www.sentry.co.uk**) gets bigger every year. Over 400 delegates listened to a series of papers presented within this year's overall theme which was* Volatile market prices or stability and food security? Choices facing the EU after 2013. *Bruce Knight reports*

Rob Napier, a farmer from New South Wales, gave an interesting insight into an Australian's view of the EU's agricultural policy. He commented that subsidies discourage productivity increases and creativity and that more Common Agricultural Practice (CAP) euros should be aimed at R & D and market development. He also signalled the need for small farming businesses to be better fostered based on new management models and re-defined roles. He also called on the farming industry not to be too farmer-centric as it is now integrated vertically and with other industries.

George Lyon has a farming background in Scotland and was a Liberal Democrat Member of the Scottish Parliament (MSP) until 2007. He is now a Member of the European Parliament (MEP) and, most significantly, is rapporteur for CAP reform. His 2010 draft report was overwhelmingly endorsed by the European Parliament. He described the future CAP policy as aiming, by 2020, to be fairer, greener, and more sustainable. The challenge is to reconcile the increased global demand for food with the constraints of land, water, energy availability and climate change parameters and come up with a fair approach. All has to be met within greater budgetary constraint.

George Lyon put forward three priority areas that need, eventually, to underscore the reformed CAP. These were sustainability, fairness and an approach which encourages increased productivity across the EU. He elaborated a little on sustainability, recognising that a new model is called for. Neither the low input-low output model nor dependence on organic methods meets the current challenges. He can, however, see that intensive farming can also be sustainable. Increased productivity but with lower inputs should be a target. He quoted wider use of Precision Agriculture methods as an example.

The issue of fairness is highlighted by the fact that the direct payments per hectare are generally higher for the EU-15 member states than for the late accession states. To bring this into balance it is argued that some re-nationalisation of the CAP may be necessary, with member state governments picking up a part of the cost. Complete re-nationalisation is not on the table, a fact that prompted more than one question from the floor.

There are still many differences to resolve between the European Parliament's and the European Commission's positions. The Parliament favours a CAP budget maintained at the 2013 level. George Lyon showed how, as a proportion of the total budget, agriculture has declined from near to 75% in 1985, to just over 45% by 2008. Also intended would be the ending of historic payments, eg crop area subsidies, by 2020, an issue yet to be agreed by all member states. Policies would also need to be fairer in the allocation of funds for rural development and farmers would be encouraged to strengthen their role in the food chain.

The main differences relate to how rural development is sustained. The European Parliament argues for putting a clear focus on which innovations to encourage such as small scale renewable energy schemes. The Commission is less focused in its targets and still proposes subsidies for small farms. George Lyon questioned whether the latter is a way to modernisation and increased agricultural productivity.

An example of how a farming enterprise has enhanced its role in the food chain was presented by John Shropshire of the Shropshire Group, Ely, Cambridgeshire. The group grows a range of fresh produce crops in the UK as well as in southern Spain and the Czech Republic. It farms over 12,000 ha of crops with sales of over £300 million and employs some 4,000 staff. John Shropshire described an important development in the UK which has seen his business establish a consortium with 15 other fresh produce growers, G's Growers Limited (**www.gs-growers.co.uk**) and G's Marketing. Important crops are leafy salads, onions, celery, and beetroot. G's Marketing consists of customer focused teams responsible for processing and packing, quality control and all procurement and trading. Its customers, primarily UK supermarkets, are supplied with UK grown produce as well as out of season crops, including citrus, from Spain.

John Shropshire emphasised that their success had been based on being market orientated and keeping production costs at a minimum through economies of scale. He welcomed the more positive interest in farming now being shown by the UK government. Spain had always welcomed farming activities and the Czech Republic, while a more industrial economy, offers support for young farmers.

Jim Paice, the UK Minister of State for Agriculture, has been present at several Sentry conferences but this was his first as a Minister. His presentation covered the need for CAP reform and he echoed many of George Lyon's observations, the need to encourage progressive innovation and not to just rely on subsidies. As agriculture is still the largest manufacturing industry in the country he made the point that it should operate sustainably not just environmentally but also as a business.

Asked whether the UK, and Europe's, rejection of GM crop production was here to stay he gave strong encouragement that future policies must be science based, rather than political. But he did not go as far as to accept that it was up to government to influence public opinion. His view is that the current EU proposals to leave decisions to member states is flawed and would be a problem within the UK where Scotland is already declared a GM free region.

Another questioner, a farmer from Norfolk, expressed his concerns on the potential loss of important herbicides as a consequence of the new EU pesticide legislation. Jim Paice described the hazard-based approach on product registrations, as opposed to a risk approach, as – "bonkers".

CROP PROTECTION IN SOUTHERN BRITAIN

Crop Protection in Southern Britain, organised by the Association of Applied Biologists, was held near Cambridge on 23-24 February and attended by some 90 delegates. A wide range of topics was covered and several of the presentations were applicable to other European countries. Bruce Knight reports.

Herbicide resistance

The first day of the conference was devoted to developments in cereals. Stephen Moss, Rothamsted Research, gave an overview on the latest status of herbicide resistant weeds. Resistant blackgrass (*Alopecurus myosuroides*) is by far the most serious problem in the UK and occurs in at least 10 other countries. It was first reported in the UK in 1982, and by 2004 resistance to a wide range of modes of action, such as ALS (Acetolactate Synthase) inhibitors, had been identified on 2,085 farms in 31 different UK counties. Today, Stephen Moss estimates that on 80% of the 20,000 farms where blackgrass control is regularly practiced, resistance to at least one herbicide is evident.

The most widely used blackgrass herbicide is now *Atlantis* (metosulfuron + iodosulfuron). In 2010 glasshouse screening studies conducted by Rothamsted and industry indicated that there was some degree of resistance to *Atlantis* on over 400 farms in 26 different counties. In the majority of cases there was also cross resistance to cycloxydim suggesting a high incidence of ACCase target site resistance. In practice the occurrence of some resistance to *Atlantis* has not prevented it being widely used by farmers. However, Stephen Moss anticipates that the situation will worsen.

A number of papers addressed the possibilities of integrating cultural weed control methods with chemical weed control as a means of offsetting the further spread of resistant blackgrass. Jim Orson from NIAB TAG, an independent research organisation (www.niab.com), concluded that inversion cultivation, ploughing, rather than minimum tillage will help to keep blackgrass seed populations down in the following crop. Stephen Moss also reported on the possibility of using a fallow year as a means of reducing weed populations. In spite of the economic implications he referred to a farmer in Essex who has fallowed some fields with success and at a time of high wheat prices.

With little evidence of new active ingredients with different modes of action becoming available for the control of blackgrass, reliance on close stewardship based on the use of herbicide programmes is considered critical. User surveys reported by Bayer CropScience showed that pre-emergence herbicides had been applied to 62% of the area treated with *Atlantis* by 2010. The dose of *Atlantis* had also been maintained at its full rate.

Other weed resistance problems were covered by Stephen Moss in his review paper. Italian ryegrass (*Lolium multiflorum*) resistance has been reported in 17 countries and in the UK the frequency of ACCase resistance is increasing. In 2010 resistance had been found on over 450 farms in 33 counties. Resistant wild oats (*Avena fatua*) are reported in 13 countries. Resistance was found on more than 250 UK farms in 28 counties in 2010. It is, however, much less of a problem in practice with 'dim' and 'den' herbicides still effective.

Of the broad leaved weeds chickweed (*Stellaria media*) and poppy (*Papaver rhoeas*) both demonstrate some resistance to ALS inhibiting herbicides in different regions of the UK. With chickweed there is also some evidence of resistance to mecoprop. Stephen Moss also reported on two new resistance developments in the UK. The first incidences of ALS resistant scentless mayweed (*Tripleurospermum inodurum*) were recorded on three farms in 2010 while the first cases of groundsel (*Senecio vulgaris*) resistance to triazinone herbicides were recorded in asparagus crops in 2010.

Septoria resistance

Resistance to cereal fungicides is of continuing concern in Northern Europe. Anne-Sophie Warner from INRA reported on the development of different strains of Septoria in France. DMI (Demethylation Inhibitor) fungicides are core to most wheat disease strategies throughout Europe and survey work carried out at INRA suggests that there are at least two resistance mechanisms in operation, target alteration and drug transporters overexpression. The highest incidence of resistant strains were recorded in north east France. Some strains show cross resistance to all DMI fungicide sub groups,

which are commonly used on wheat. Therefore some estimates of the level of selective pressure that will occur are urgently needed.

EU pesticide regulations

The potential impact of the new EU thematic strategy for pesticide regulations was summarised by Grant Stark, Chemicals Regulation Directorate (CRD). He said there were two main elements to the new legislation that was passed in 2009 and comes into force in stages starting in June of this year. Firstly the Pesticide Authorisation Regulation, PAR, which outlines the new criteria for product registrations, Regulation 1107/2009 (replacing Directive 91/414), and secondly the Sustainable Use Directive, SUD. The latter covers issues such as training, sales, testing of application equipment, handling and storage, use in public places, use in proximity to water and promotion of integrated pest management (IPM). An additional two regulations cover the publication of pesticide use statistics and new rules on standards for sprayers and application equipment. Grant Stark indicated that in the UK a lot of the measures defined under the SUD directive have already been adopted.

The impact of the 1107/2009 regulation is less clear. It is much more prescriptive than the original 91/414 and, as widely reported, the basis for evaluation of new active ingredients will be based on hazard rather than risk. Responding to a question from the floor, Grant Stark did not see the Commission reversing this decision, despite the fact that several member states, including the UK, voted against it. Registration of pesticides which are defined as endocrine disruptors will not be permitted. However there is still uncertainty on the definition of an endocrine disruptor. The deadline set to resolve this issue is the end December 2013. The indications are that the European Commission will chose to use all of that time available before deciding. Grant Stark made it clear that a high proportion of the existing pesticides are not up for review before 2015, consequently the real impact from potential product withdrawals will not start before 2015/16.

Janet Williams, Bayer CropScience, gave an industry view of the proposed EU regulations. She said that the adoption of a hazard based approach was clearly a major limitation. There is also a proposed mechanism under 1107/2009 whereby each active ingredient as it comes up for review is judged on its potential as a ‘candidate for substitution’. The decision on whether its registration is maintained will be based on alternative choices, chemical or non-chemical, which offer a safer solution. The uncertainty is what is defined as ‘safe’. Janet Williams said that if one product is unsafe to earthworms and another to bees, which criteria are to be used.

The fact that there will be no provisional registration is also a disadvantage. This had been used to good effect by companies in the UK. Nonetheless industry would accept going direct to a full registration procedure provided it is rapid once the necessary dossiers have been submitted. The timeframe indicated under 1107/2009 is put at up to 36 months whereas in principle under 91/414 the target has been up to 18 months. In practice, however, it has usually been much longer.

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